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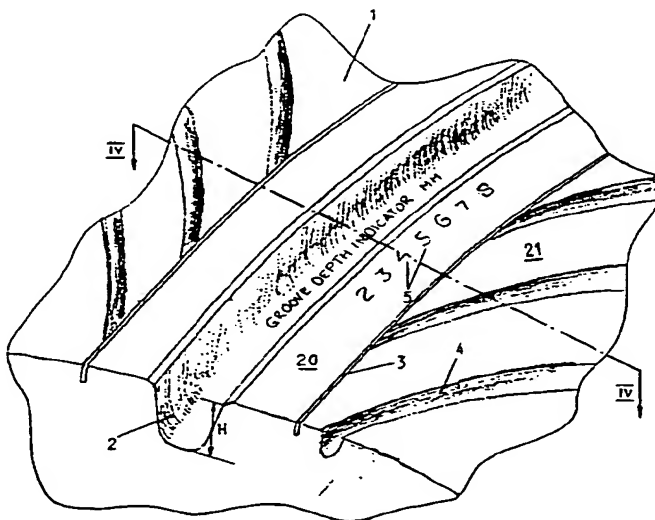
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**(54) Wear indicator for vehicle tyres**

(57) The present invention relates to a wear indicator for a vehicle tyre (1), the tread of said tyre being provided with grooves (2) to improve the grip. As taught by the invention, the surface of the tread in contact with the road surface is provided with indicators (5) indicating the momentary groove depth (H) of the tyre, said indicators forming at least one group of elements and extending in radial direction into the tyre. The element depth grows

by predetermined steps from the shortest element to the longest element. The indicator is formed from a sipe (5) the depth of which is advantageously smaller than the depth (H) of said groove and the cross-section of which in the direction of the tread forms a number, letter, sign or symbol, image or equivalent determining the groove depth of the tread on the height of the plane in the direction of the tread which is tangential to the bottom (2p) of the capillary groove.



**Fig. 1**

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## Description

[0001] The present invention relates to a wear indicator for vehicle tyres as described in preamble to claim 1.

[0002] The grooving of tyres has an essential impact on the grip of the vehicle in dry, and particularly in wet road conditions. From the point of view of safe driving, it is important to monitor wearing of tyres and reduction of the groove depth so that a groove which has worn down and become too low would not cause a surprise in poor road conditions. Also a given groove depth in the tyres is required for a car to be in appropriate condition for inspection.

[0003] For following up the wear of a tyre, various tyre structures have been developed

[0004] In patent specification WO-97/47483 a tyre structure is known the wearing of which can be followed by means of wear indicators disposed in the tread, and therethrough learn when the location of a tyre in the vehicle should be changed. The wear indicators are recesses formed in the tread, extending to different depths or protruding parts formed to be in conjunction with the grooves and extending to different depths. The wear indicators are spread on the entire circumference of the tyre. The depths of consecutive indicators will grow uniformly from the lowest to the deepest. When the wear of a tyre has been continuing so long that some of the indicators have worn off and the pattern formed by the indicators has therefore changed, we know that the location of the tyre should be changed. The wear indicators do not indicate anything of the groove depth.

[0005] In patent specification No. DE-OS-36 27 832, a tyre structure is known the wearing of which can be followed on the basis of the wearing of a stepped structure formed on the tread, preferably to be in conjunction with grooves. A kind of marking is made on the step levels of the stepped structure, for instance unending numbering.

[0006] However, the numbering of the step levels will not indicate anything of the depth of the groove. For instance, when steps 3 and 4 are visible in the tread, it is possible to conclude on the basis of the lowermost number "4" that the tread had included four steps altogether, but what this means relative to the overall wear and how much of the groove depth still remains will not become apparent.

[0007] In patent specification No. US-2.706.509, a tyre structure is known in which wear indicators have been formed on one wall or on the opposite walls of a groove. The indicators are step-wise formed so that each step is of equal height and extends from the tread to the bottom of the groove. The remaining groove depth is equal to the number of the remaining intact steps multiplied by the depth of the step plus the remaining depth of the step in the tread. The depth of one step or the number of the steps have not, however, been visibly marked in the steps. Because of the soiling of the tyre and the grooves being filled with soil it is difficult to ex-

amine the steps. For instance, the numbers in Figure 5, which belong to different steps are not measurement values but merely reference numbers of steps. When the tread extends to line 17, nine step surfaces 1 to 9 are remaining. Assuming that not a single step surface has worn off, each step height is equal to one tenth of the entire groove depth. Hence, nine full tenth parts of the groove depths are left plus one partly worn topmost step. Consequently, the wearing is something between zero and one tenth.

[0008] In patent specification No. EP-250,113 A3, tyre wear indicators are known which are formed from capillary slits of different depths and assembled into groups which have been divided across the tread on different sides of the middle line in circumference direction. Within a group, the capillary slits are mutually of the equal length. The function of the indicators is to indicate the uneven wearing of the tyre. This is carried out so that when a tyre is balanced and is wearing down evenly on both sides of the middle line in circumference direction, the tread pattern formed by the indicator groups also changes symmetrically, that is, the shortest capillary slits, mutually of equal depth, on both sides of the middle line, disappear simultaneously from the tread. When a tyre wears unevenly, the tread pattern starts to change on the side of the tyre which wears more before the tread pattern on the other side of the tyre changes. The wear indicators do not yield any information on the amount of reduction of the groove depth.

[0009] The objective of the present invention is to produce a tyre structure which is provided with indicators indicating the groove depth, on the basis of which the groove depth of the tread can easily be estimated at each time, i.e. at the moment in question.

[0010] This is accomplished with a tyre determined in the characteristic features' part of claim 1.

[0011] In the surface part of tyre tread pattern pieces or of ribs, which are in contact with the road surface, indicators are formed in the form of sipeor grooves, extending radially into the tyre. The cross-section in the direction of the tread of the sipe represents a number, letter, character or image or equivalent, informing of the groove depth of the tread in the plane in the tread direction tangential to the bottom of said indicator. Thus, the visible cross-sectional shape of the sipe indicates the groove depth in the plane of the sipe bottom either as numerical value or with a word, sign, symbol or equivalent describing the condition thereof.

[0012] According to an advantageous embodiment of the invention, the indicators form at least one group of indicators. The depth of each indicator belonging to an indicator group increases by predetermined steps, so that, respectively, the groove depth in the bottom plane of the indicator is smallest below the deepest capillary groove, growing therefrom by equal steps towards the greatest depth. The informing cross-section diagrams of the indicator group represent, for instance in numbers 2, 4, 6, 8, 10 or 2, 4, 8, 12, 16 the groove depth below

the indicator. In the former case, the groove depth grows in equal steps and in the latter, first by two and after that by four units, advantageously by millimeter. It is certainly more important to receive more specific information about the groove depth the closer the depth is to the permitted lower limit, whereas when a less worn tyre is in question, it is not essential to know the degree of wearing with the same accuracy.

**[0013]** According to an advantageous embodiment of the invention, the deepest indicator is at most as deep as the groove of the tread, but advantageously at least 1 to 2 mm lower than that so that it will give a warning of the small remaining groove depth.

**[0014]** According to an advantageous embodiment of the invention, the indicator capillary grooves are formed at sufficient spaces in the tread so that in the tyre cast phase, rubber mass may enter into all spaces formed by lamellae. A sufficient space between the indicators is approximately equal to the greatest dimension of the cross-section image of individual indicators.

**[0015]** According to an advantageous embodiment of the invention, the tread is preferably provided with two or more identical indicator groups, spread on both sides of the middle line in circumference direction of the tyre and/or approximately at equal spaces on the entire tyre circumference. Hence, one group of indicators is always located in a visible location, irrespective of the fact in which wheel the tyre is located and where the inspector is standing.

**[0016]** According to an advantageous embodiment of the invention, the indicators are Arabic or Roman numerals or numerals of any other numerical system or other graphic signs, symbols or images. Letters or characters can be used as graphic signs. Thereby, the information provided by letters concerning the groove depth can be expressed in words describing the condition of the tyre. The letters forming one word always extend to the same groove depth. The condition of a tyre can be described, for instance with words "VERY GOOD CONDITION", so that the letters of the word "VERY" always extend only a little distance into the tread, and the letters of the words "GOOD CONDITION" extend deep, for instance to a plane in which only 3 mm of the groove depth is left. The letters of "VERY" wear at a relatively early stage off so that the tyre indicates then "GOOD CONDITION".

**[0017]** While in this condition, the tyre can be used for driving for a relatively long time, and it is not until only 3 mm of the groove depth is left, the words "GOOD CONDITION" wear off.

**[0018]** According to an advantageous embodiment, the indicators can be of the shape of W and S. The letters W wear down more rapidly so that the letters S which extend deeper remain. The mere S indicators show that a tyre originally appropriate for winter tyre (W + S) is merely in summer tyre condition.

**[0019]** According to an advantageous embodiment, for the indicator a well-known "smiling mouth" image can

be used, with a round face, two spots for eyes and a smiling mouth. The indicators are formed from a smiling mouth indicator and a sorry mouth indicator, and possibly also from a straight mouth indicator. The smiling mouth extends only a little bit into the tread so that the smiling condition of the tyre is over after the smiling mouth indicator has worn off from the surface. The sorry mouth indicator and possibly the straight mouth indicator are left there. When the alarming sorry mouth indicator alone is visible, it is time to replace the tyre.

**[0020]** According to an advantageous embodiment, the surface of one piece or preferably of more tread pattern pieces is provided with indicators representing a series of numbers. The series of numbers are advantageously growing from the margin towards the middle line, so that the numbers in the middle, indicating a greater depth, are the first ones to wear off from the surface. Various tread pattern pieces may be provided with the same series or different series of numbers, so that the different series of numbers disappear from the surface at different speeds. When such number series indicators are disposed in adjacent tread pattern pieces in the width direction of the tyre, information is received, not only about groove wear but also about potential uneven wear. Individual numbers are provided advantageously in the form of capillary grooves being mutually apart. Capillary grooves extending across the pattern piece can be provided between rows of numbers.

**[0021]** According to another advantageous embodiment of the invention, the indicators indicating the groove depth have been formed in a groove, in the upper surface of a piece formed between the walls bordering the groove, said upper surface being planar and parallel to the tread.

**[0022]** This is appropriate particularly for winter tyres, the tread pattern pieces of which already have been provided a plurality of capillary grooves for enhancing the grip to the road. Forming additional grooves in tread pattern pieces of a winter tyre may cause that the tyre becomes unstable and, in addition, the tread pattern of the tread would suffer from it. Also making a mould for the tyre becomes more difficult and the casting is not always successful either. When forming indicators in a piece like that in a groove between the tread pattern pieces, the tread pattern shaping of the tread will not suffer therefrom.

With the exception of the location, the indicators formed in a groove piece are similar to the indicators described above, being formed in the wear surface.

**[0023]** According to an advantageous embodiment, the piece formed in the groove is only attached on one wall bordering the groove and detached from the opposite wall, which is preferable concerning the grip to the road.

**[0024]** According to an advantageous embodiment, the piece formed in a groove is stepped, which is similarly preferable concerning the grip to the road. One indicator of one indicator group has been formed in each

step.

**[0025]** As the indicator acting as a wear warning according to the invention, a series of numbers is preferred which clearly indicates the groove depth remaining in the bottom plane of each capillary groove. If a series of numbers with the highest number 5 can be seen on the tread of a slightly worn tyre, it means that 5 mm or five of other measuring units of groove depth plus the height remaining in the sipe are remaining.

**[0026]** A great advantage of a tyre according to the invention compared with other corresponding structures known in prior art is that the pattern formed by the indicators in the tread can easily be checked, and it will tell directly the condition of the wear surface at each moment by means of measuring figures, words or images.

**[0027]** As a matter of fact, the words can be in any language and in any letters or characters as long as they can be understood to indicate the remaining groove depth of the tread as a measuring figure or in proportion to the acceptable measuring figures determined by legislation.

**[0028]** Indicators in the form of sipe can, according to the invention, be used both in summer and winter tyres. In a summer tyre, they are generally disposed in ribs in circumferential direction, and in a winter tyre, they are fitted in ribs and/or in the surface of tread pattern pieces or in grooves between tread pattern pieces. They are advantageously fitted between other capillary grooves or possibly in conjunction therewith. When the indicators are disposed in winter tyre grooves, in groove pieces located in the grooves, the capillary indicator grooves will not cause any trouble in providing tread pattern pieces with other capillary grooves to increase the grip to the road. When positioning indicators in a tread pattern piece of a winter tyre, they contribute to the grip of the tyre to the road and make it better.

**[0029]** Indicators of different types are provided using the lamination technique of the invention. Lamellae corresponding to indicators are disposed in the segments of a tyre mould so that corresponding indicators in the form of capillary grooves are formed in the finished tyre. The production is simple and the sipe indicators will not increase significantly the tyre production costs.

**[0030]** Below, a number of advantageous embodiments of the tyre of the invention are described, reference being made to the accompanying figures, in which

Figure 1 presents in an outline 3D image part of a summer tyre provided with indicators of the invention.

Figure 2 presents in top view the tyre of Figure 1, viewed in axial direction;

Figure 3 presents a vertical section of Figure 2 along line III-III;

Figure 4 presents a vertical section of Figure 1

along line IV-IV;

Figure 5a presents a top view of a tyre of another embodiment viewed in peripheral direction;

Figure 5b presents in top view a diagram of a number row formed by indicators and of groove depths indicated by the numbers, of the height dimensions of the numbers and of the dimensions of the spaces between the numbers for producing a mould;

Figure 6 presents in an outline 3D image part of a summer tyre provided with information in words;

Figure 7a shows in an outline 3D image a tread pattern piece of a winter tyre, the tread whereof being provided with indicators in numbers, being in each indicator row the same number;

Figure 7b shows in an outline 3D image a tread pattern piece of a winter tyre, the tread whereof being provided with indicators in numbers, said indicators being formed between the capillary grooves of the tread pattern piece;

Figure 8 presents in an outline 3D image a tread pattern piece of a winter tyre, the tread whereof being provided with indicators in numbers, representing letters S and W in rows;

Figure 9 presents in an outline 3D image two tread pattern pieces of a winter tyre, the tread whereof being provided with a smiling mouth indicator and a sorry mouth indicator;

Figure 10 presents in an outline 3D image a tread pattern piece of winter tyre and a groove therebetween, between the walls of which stepped groove piece for indicators is formed, and

Figure 11 presents in an outline 3D image two tread pattern pieces of a winter tyre and a groove therebetween, between the walls of which a planar groove piece for indicators is formed.

**[0031]** Figure 1 presents a part 1 of a summer tyre in an outline 3D image. A groove 2 in circumferential direction between the tread pattern pieces is shown in the middle of the figure, and in parallel direction therewith, two capillary grooves 3 are running in the tread pattern pieces, to which grooves the main grooves 4 in the tyre lead, said main grooves being formed as curved slanted grooves. The ribs in the circumferential direction on both sides of the groove 2 are marked with reference numeral 20 and the tread pieces between the slanted grooves are marked with reference numeral 21. Groove 2 is one of the grooves the depth H of which is monitored and

which are required to meet the statutory depth values. In the figure the tyre part 1 is new and totally unworn. On the bottom of the groove 2 it reads "GROOVE DEPTH INDICATOR MM". On the smooth tread part adjacent to the groove 2 a row of numbers "2 3 4 5 6 7 8", formed by indicators 5 parallel with the groove 2 is shown. Indicators 2 to 8 are formed from capillary grooves 5 being numbers in cross-section. Figure 2 shows the row of numbers and the immediate adjacency thereof in top view. Figure 3 shows the row of numbers in vertical section along line III-III of Figure 2, and the depths of different indicators 5. Figure 3 illustrates how there are 2 mm between the bottom of the deepest sipe representing number "2" and the line 2p indicating the bottom of the groove 2, 3 mm respectively between the bottom of the sipe and the line 2p, and finally, 8 mm between the bottom of the sipe representing number "8" and the line 2p.

**[0032]** When the tread wears down in driving, the sign indicating number "8" disappears first, so that there are not 8 mm of the groove depth left, but the depth indicating the next number "7" added with the part of the step between "7" and "8", that is, more than 7 mm. For instance, after the three lowest indicators 5 have worn off from the tread, the indicator indicating "5" plus its adjacent deeper indicators, indicating a smaller depth, are visible. At that point, more than 5 mm of the groove depth is left, that is, over 5 mm but less than 6 mm. When only the last indicator is left, we know that the groove depth is a bit over 2 mm. When the indicator indicating number "2" is disappearing from the tread, we know that the minimum depth of the groove is close and that it is time to replace the old tyres. Figure 4 which is a vertical section made along line IV-IV of Figure 1 presents the sipe 5 illustrating indicator "4". The height between the bottom line of the sipe and the bottom line 2p of the groove 2 is 4 mm. When this sipe has just worn off, a groove depth of 4 mm is left in the tread.

**[0033]** Figure 5a shows an embodiment similar to Figures 1 to 5, with the difference, however, that the indicators 5 illustrating numbers can be read in the circumferential direction of the tyre when in the preceding embodiment they can be read in the axial direction of the tyre. On both margins of the tread a small triangle is moreover added and letter abbreviations TWI (TREAD-WEAR INDICATOR) and DSI (DRIVING SAFETY) showing where the indicators indicating the tread wear can be found.

**[0034]** Figure 5b presents the depth figures of the indicators for making the mould: at number "8" the sign depth is 0.6 mm and the groove depth therebelow is 8 mm, at number "7", respectively, 1.6 mm and 7 mm, and at number "2" respectively, 6.6 mm and 2 mm. The lamellae forming the indicators are required to be of this height. The depth of the groove in said tyre is 8.6 mm. The height of indicators is 5.5 mm and the space therebetween is 5 mm. It becomes obvious from the figure that the capillary grooves 5 representing the numbers

have been formulated into open numbers so that neither any very narrow gap nor a closed formation is formed anywhere into which it is difficult or impossible for the rubber mass to enter. For instance, number "8" has been made open on both sides.

**[0035]** When number 2 only is visible, 2 mm plus part of the sign space 1 mm of the groove depth are left. At this point, the tyre change is soon coming timely. As regards summer tyres, the groove depth is required to be at least 1.6 mm according to the statutes internationally in force. When number "2" is just disappearing from the tread, 2 mm of the groove depth is left, so that merely 0.4 mm reserve is left for tyre change.

**[0036]** Figure 6 shows information formed from words "very good condition" in rib 20. An outline is depicted with vertical broken lines in the figure to show how the word "very" has a smaller depth and the words "good condition" have a greater depth, this being mutually the same depth.

**[0037]** At the bottom of the groove 2 of the tyre reads a non-abrasive message "Message from tyre". The message can be, for instance, depressed on the surface of the groove or it can be cast on the surface of the rubber. In a new or only slightly worn tyre, information "very good condition" can be read, and in a more worn tyre respectively, "good condition". When no information can be seen in the tyre, it is time to change the tyre.

**[0038]** Figure 7a presents an embodiment of a tread pattern piece 30 of a winter tyre in which the indicator rows 35 are formed merely from three detached, mutually identical numbers. This kind of arrangement reveals easily uneven wear of the tread in the axial direction of the tread.

**[0039]** Figure 7b presents another embodiment of a tread pattern piece 30 of a winter tyre in which the indicator rows 35 are formed merely from three sparsely disposed indicators 5 and capillary grooves 31 between the indicator rows. Each indicator row is provided with numbers of different sizes and their numerical value is greatest at the middle line of the tread pattern piece and smaller at the margins. Two rows of the indicators are mutually identical and one is different.

**[0040]** Figure 8 presents another embodiment of a tread pattern piece 30 of a winter tyre in which indicator rows are formed from letters S and letters W. After the W letters have worn off from the surface, the letters S are still visible and indicate that the tyre is acceptable for summer driving but no longer for winter driving.

**[0041]** Figure 9 presents another embodiment of the tread pattern piece 30 of a winter tyre in which a smiling mouth indicator and a sorry mouth indicator have been formed in the tread. When the smiling mouth starts to disappear from the tread, the groove depth of the tyre is approaching the acceptance limit, and when the sorry mouth disappears from the surface, the tyre must not be used.

**[0042]** Figure 10a presents an embodiment of the tread pattern piece 30 of a winter tyre in which a stepped

groove piece 40 is formed in the direction of the circumference between the walls of the groove, which even at the highest point is lower than the tread. The desired indicators numbers, characters or equivalent can easily be formed in the groove piece without paying attention to anything of the sipeformation of the tread pattern piece. That is to say that capillary grooves cannot be formed densely in tread pattern pieces because that would make the tyre unstable and deteriorate the driving properties of the tyre significantly.

[0043] The groove piece of Figure 10a is attached merely on one groove wall and unattached from the opposite groove wall. This will improve the grip of the tyre. Indicator "8" is included in the highest groove piece step, indicator "6" in the next and indicator "4" in the lowest step. After the indicator "4" has worn off, less than 4 mm of the groove depth is left and the moment of changing the tyre is approaching.

[0044] Figure 10b presents a modification of the preceding embodiment. A planar groove piece 50 has been formed in the groove 20 between the tread pattern pieces, in which an indicator row is formed, containing numbers "3 - 5" indicating various groove depths. The production mould of this kind of tread is simpler and the casting succeeds more easily but the driving properties of the tread in winter conditions are not equally good because, as regards that aspect, the groove 2 is filled.

[0045] As becomes obvious from the facts above, a plurality of modifications are available. In addition to those mentioned in the preceding, various other wear indicators according to the claims below can be found.

## Claims

1. Wear indicator for vehicle tyre (1), the tyre tread of which is provided with tread pattern pieces (30), ribs (20) in the direction of circumference and/or tread pieces (21) between slanted grooves (4), and grooves (2) therebetween, and the surface of the tread pattern pieces (30), the rib/ribs (20) and/or the tread pieces (21) in contact with the road is provided with an indicator or indicators (5) indicating the groove depth (H) of the grooves (2) in the form of a sipe or capillary grooves, said indicators extending radially from the tread into the tyre, and their cross-section in the direction of the tread being formed into a number, letter, character or image **characterized** in that the cross-section in the direction of the tread of each indicator (5) is over its whole length formed into a number, letter, character or image which extends into the tread a distance corresponding to the information disclosed by it, whereby the indicator disappears from the tread when the wear has advanced to the depth illustrated by it, and the groove depth at that moment can be read from the indicator remaining in the tread and disclosing the greatest depth.
2. Wear indicator according to claim 1, **characterized** in that the indicators (5) form at least one group of indicators and that the depth of each indicator of the group increases at predetermined steps from the lowest depth to the deepest depth.
3. Wear indicator according to claim 2, **characterized** in that the depth of each indicator (5) of the indicator group increases evenly from the lowest indicator to the deepest indicator.
4. Wear indicator according to claim 2, **characterized** in that the depth of each indicator (5) of the indicator group increases unevenly from the lowest indicator to the deepest indicator so that the increment is less at the deeper indicators and greater at the lower indicators.
5. Wear indicator according to any one of claims 1 to 4, **characterized** in that the deepest indicator (5) is at most as deep as the groove (2), advantageously at least 1-2 mm lower than the groove so that it gives a warning of the small remaining groove depth.
6. Wear indicator according to one or more of the preceding claims, **characterized** in that for securing a good result in casting the tyre, the distance between the indicators (5) in the tread is approximately the same as the greatest dimension of an individual indicator on the tread.
7. Wear indicator according to one or more of the preceding claims, **characterized** in that the tread is provided with two or more mutually identical groups of indicators (5) placed on different sides of the circumferential middle line and/or approximately at equal distances on the circumference of the tyre.
8. Wear indicator according to one or more of the preceding claims, **characterized** in that the indicators (5) indicating the groove depth are Arabic or Roman numerals or numerals of any other numerical system or other graphic signs, symbols or images.
9. Wear indicator according to claim 8, **characterized** in that the graphic signs and symbols are letters or characters and that each indicator group (5) is comprised of at least two indicator chains, each of which comprising equally deep consecutive indicators being letters or characters, which together form a word.
10. Wear indicator according to claim 9, **characterized** in that for graphic signs, indicators shaped as W and S are used so that the W indicator indicates a deeper groove depth (H) appropriate for winter driving and the S indicator indicates a lower groove depth (H) appropriate for summer driving.

11. Wear indicator according to claim 1, **characterized** in that for indicators (5) indicating the groove depth (H) a group of images is used, the image representing the deepest depth of which is positive, such as "smiling mouth", the image presenting a half-worn tyre is striking, such as "straight mouth" and the image presenting an almost worn-out tyre is warning, such as "sorry mouth". 5
12. Wear indicator according to one or more of claims 1 to 11, **characterized** in that one or more tread pattern pieces (30) are provided with indicators presenting series of numbers, advantageously so that the series of numbers grow from the margins of the tread pattern piece towards its middle line, so that the indicators indicating the greatest depth are the first to wear off from the tread. 10 15
13. Wear indicator according to claim 12, **characterized** in that the series of numbers are identical or different. 20
14. Wear indicator for vehicle tyre (1), especially for winter tyre, the tread whereof being provided with tread pattern pieces (30), ribs (20) in the direction of circumference and/or tread pieces (21) between the slanted grooves and grooves (2, 4) separating them, and capillary grooves (31) in the surface of the ribs of the tread pattern pieces or of the tread pieces to improve the grip, and in which tread a groove piece (50) has been formed in the groove (2) between the walls along the groove, the top surface whereof being planar and in parallel direction with the tread and preferably located lower than the tread, and in which top surface indicator/indicators (5) are formed indicating the groove depth (H) of the grooves (2), said indicators being formulated as sipeor grooves extending in radial direction from the tread into the tyre, the cross-section of the indicator/indicators (5) in the direction of the tread being formulated into a number, letter, character or image **characterized** in that the cross-section in the direction of the tread of each indicator (5) over its whole length is formulated into a number, letter, character or image which extends into the tread a distance corresponding to the information disclosed by it, whereby the indicator disappears from the tread when the wear has advanced to the depth illustrated by it, and the groove depth at that moment can be read from the indicator remaining in the tread and disclosing the greatest depth. 25 30 35 40 45 50
15. Wear indicator according to claim 14, **characterized** in that the indicators (5) form at least one indicator group and that the depth of each indicator of the group grows by predetermined steps from the lowest depth to the deepest depth 55
16. Wear indicator according to claim 14 or 15, **characterized** in that a groove piece (40) has been formed attached to one tyre part bordering the groove (2) and unattached to the opposite bordering tyre part.
17. Wear indicator according to any one of claims 14 to 16, **characterized** in that the deepest indicator is at most as deep as the groove (2), preferably by 1 to 2 mm lower than the groove so that it will warn of the small remaining groove depth.
18. Wear indicator according to any one of claims 14 to 17, **characterized** in that the piece (40) formed between the walls bordering the groove (20) is so stepped that one indicator (5) is formed in each step, so that the highest step includes the indicator presenting the highest groove depth (H) and the lowest step includes the indicator indicating the smallest groove depth.
19. Wear indicator according to one or more of claims 14 to 18, **characterized** in that the indicators (5) indicating the groove depth are numbers of Arabic, Roman or other numeric system or other graphic signs.
20. Wear indicator according to claim 19, **characterized** in that letters or characters are used for graphic signs, and that each indicator group is formed at least of two indicator chains, each comprising equally deep consecutive indicators (5) in letters or characters which together form a word.

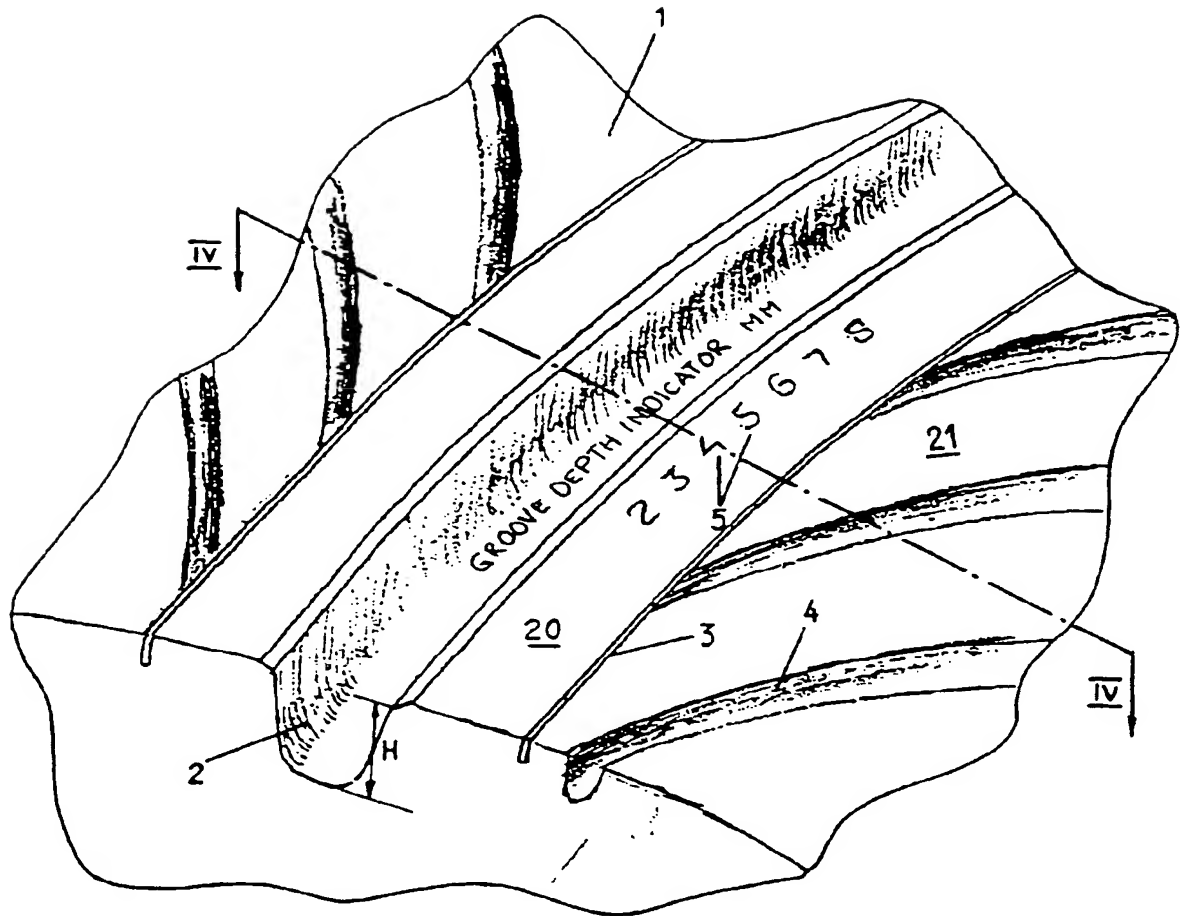


Fig. 1



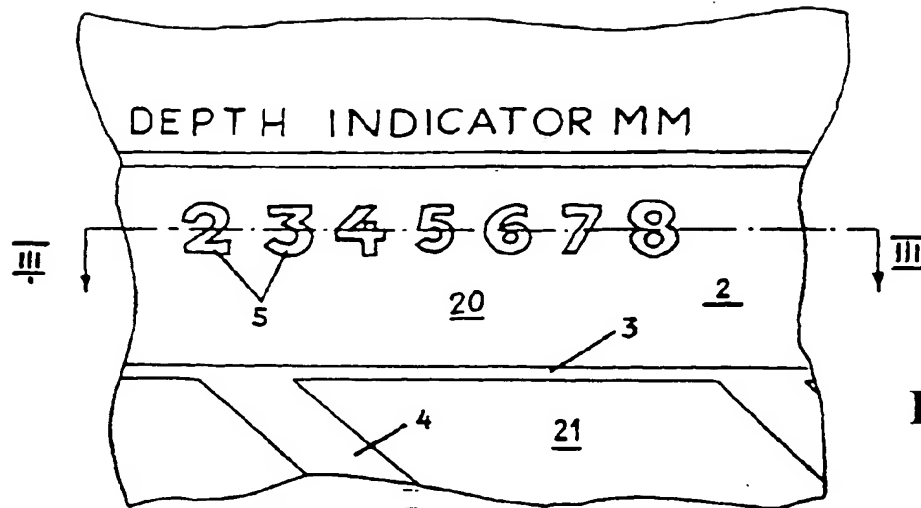


Fig. 2

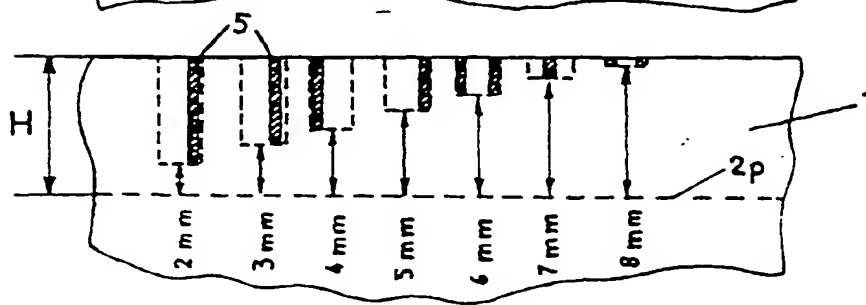


Fig. 3

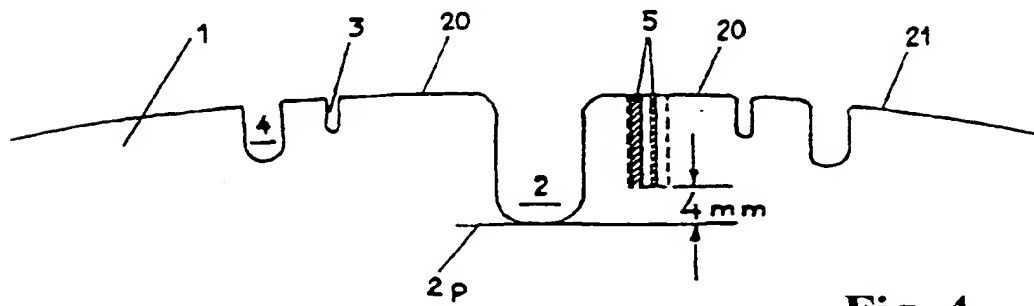
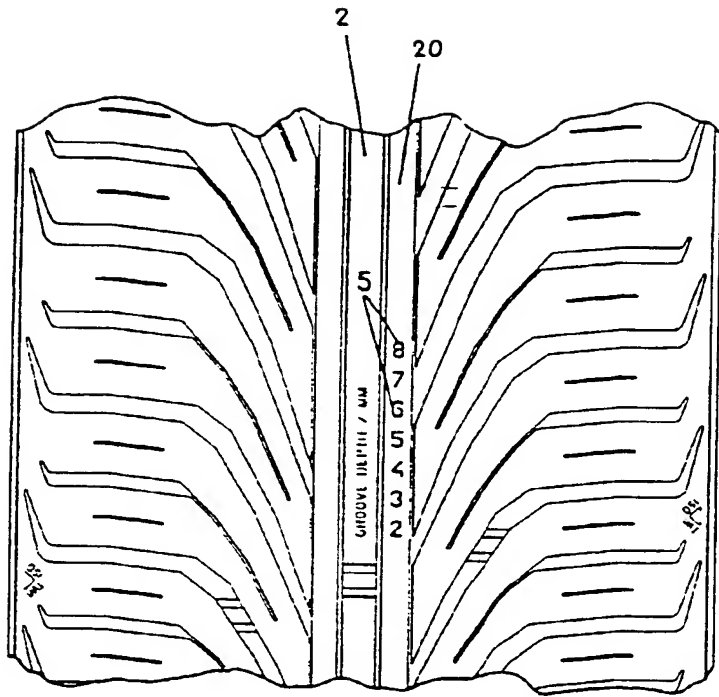
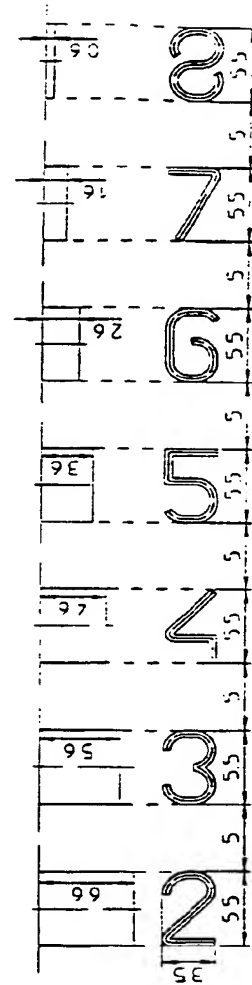


Fig. 4



**Fig. 5a**



**Fig. 5b**

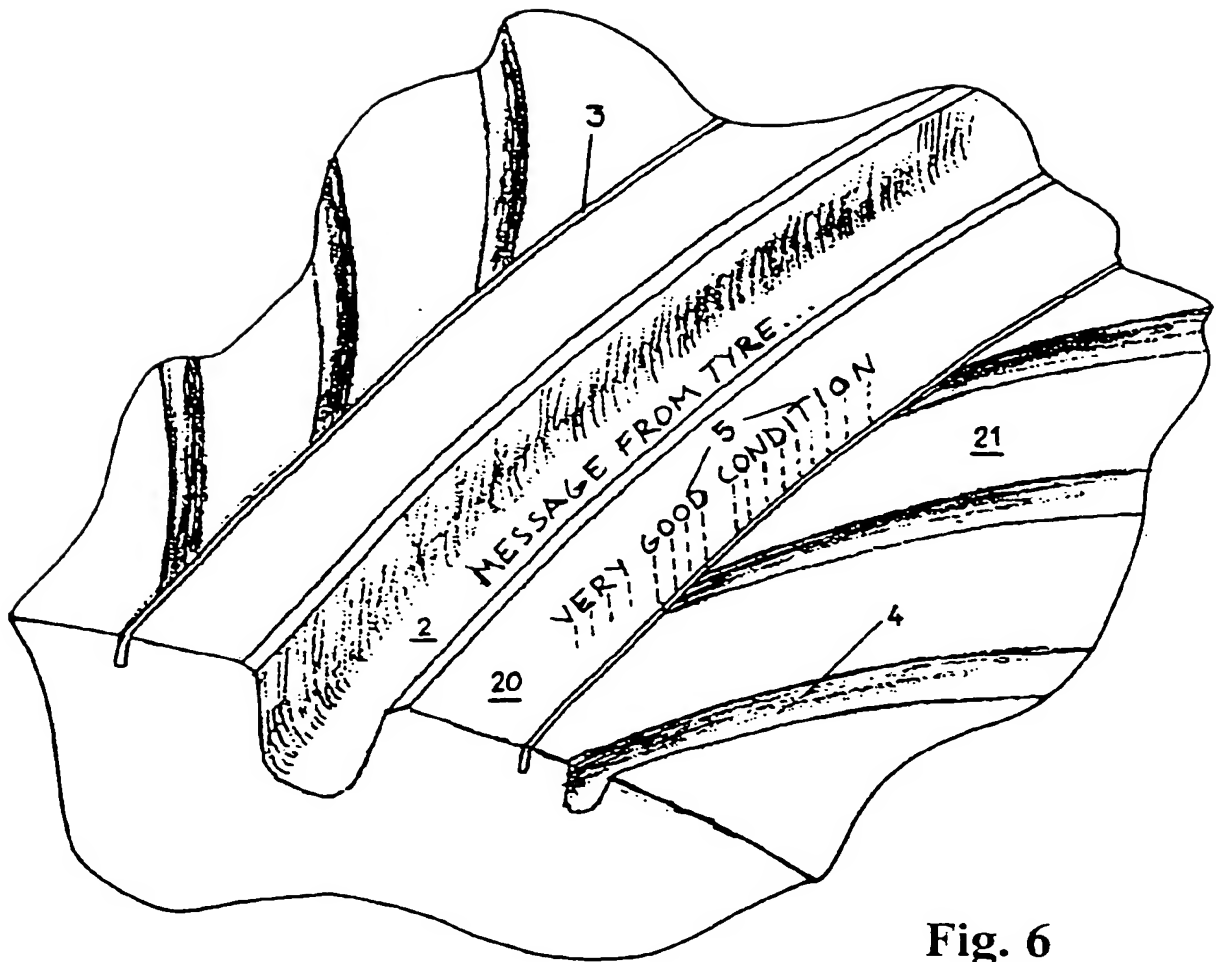
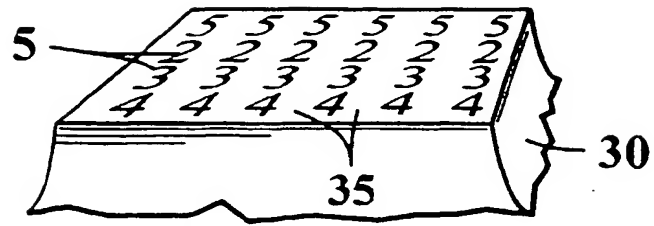
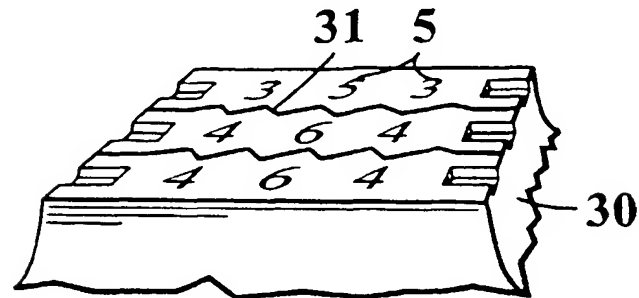


Fig. 6

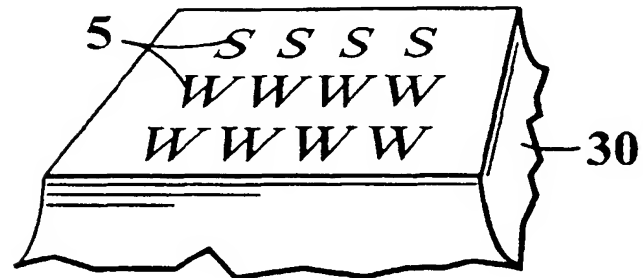
**Fig. 7a**



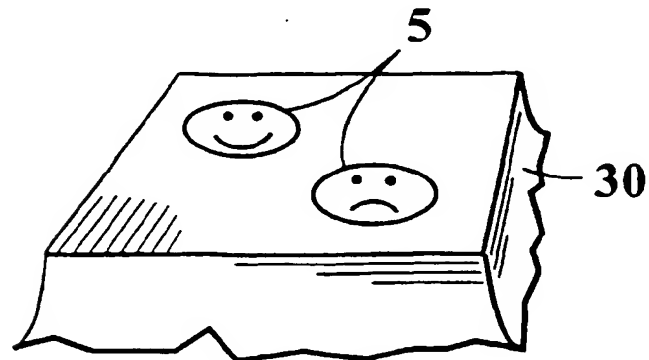
**Fig. 7b**

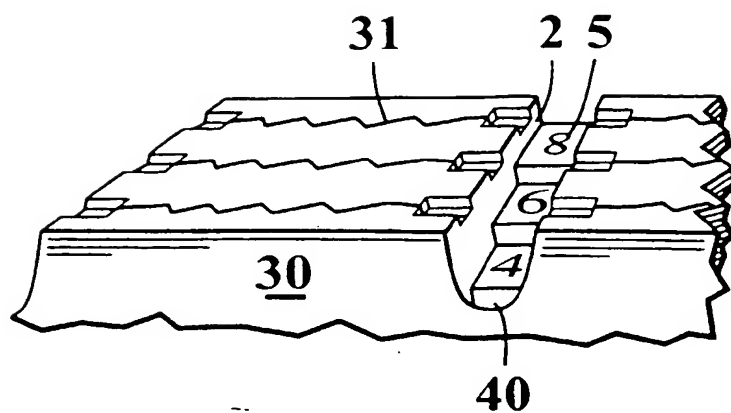


**Fig. 8**

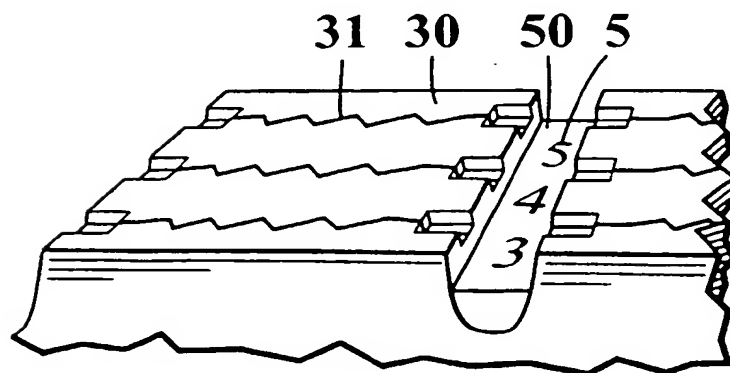


**Fig. 9**





**Fig. 10**

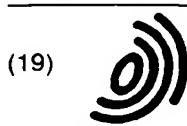


**Fig. 11**

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### (54) Wear indicator for vehicle tyres

(57) The present invention relates to a wear indicator for a vehicle tyre (1), the tread of said tyre being provided with grooves (2) to improve the grip. As taught by the invention, the surface of the tread in contact with the road surface is provided with indicators (5) indicating the momentary groove depth (H) of the tyre, said indicators forming at least one group of elements and extending in radial direction into the tyre. The element depth grows

by predetermined steps from the shortest element to the longest element. The indicator is formed from a sipe (5) the depth of which is advantageously smaller than the depth (H) of said groove and the cross-section of which in the direction of the tread forms a number, letter, sign or symbol, image or equivalent determining the groove depth of the tread on the height of the plane in the direction of the tread which is tangential to the bottom (2p) of the capillary groove.

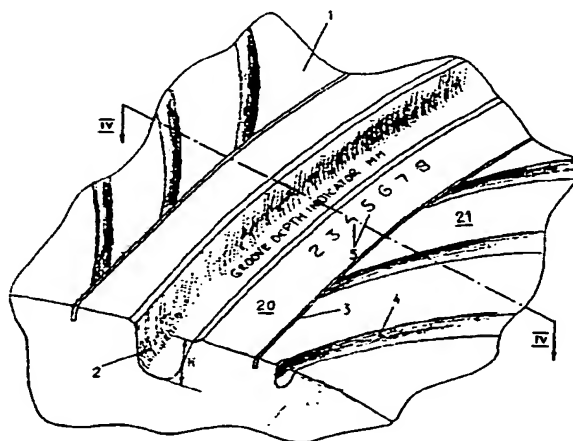


Fig. 1



European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 00 66 0119

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			B60C
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>2 October 2001</b>	Examiner <b>Bibollet-Ruche, D</b>
CATEGORY OF CITED DOCUMENTS X particularly relevant if taken alone Y particularly relevant if combined with another document of the same category A technological background O non-written disclosure P intermediate document I theory or principle underlying the invention E earlier patent document, but published on, or after the filing date D document cited in the application L document cited for other reasons & member of the same patent family, corresponding document			

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